Chapter A-17

CONSTRUCTION PROCEDURES AND WATER CONTROL PLAN

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A-17.1 INTRODUCTION

Previous chapters of this appendix have discussed the proposed improvements under the areas of interest for the Kansas Citys Flood Damage Reduction Feasibility Study Interim Report. The constructability of these improvements needs to be carefully considered. As this study deals with an existing system of protection, there are greater potential constraints with respect to infrastructure than there likely would be for new levee construction.

It should be noted that high water conditions may occur while construction is in progress. Plans and specifications for the proposed work will address measures to maintain the integrity of the levee during these periods. The measures will provide for 100-year level of protection and the ability to bring the protection back to the design level if needed. Common measures for water control include dewatering, construction of ring levees, and emergency backfilling of open excavations. Sandbags and pumping can also be used to supplement the effort. Preferably, work within the critical area of the flood protection project will be scheduled during dry periods of the year. Excavation in the critical area will be avoided around periods of ground saturation.

For the purposes of this chapter, it is assumed that the Nominal 0.2% chance (500-year) plus 3 feet is the chosen alternative. Discussions in the following sections represent the level of construction necessary to safely meet the requirements of this alternative.

A-17.2 ARGENTINE RAISE

The potential levee raise required that underseepage and slope stability analyses be completed on the landside of the levee. Additionally, the Structural Analysis – Existing Conditions chapter contains an evaluation of the existing floodwalls', gatewells', closure structures', and drainage structures' abilities to facilitate a raise in the unit's level of protection.

A-17.2.1 Site Constraints

A levee top cap, I-wall, and relief wells have been proposed in the areas of railroad tracks. Construction of the I-wall will be difficult. This item may require the removal of the entire crest of the levee and replacement in order to accommodate the crane. Also, sequencing of the concrete placement and sheetpile placement will have to be worked out. It will be difficult to place concrete around any of the sheetpiling driving operations. Additionally, the Sinclair Chemical, Harcross Chemical, and Santa Fe Railroad areas of Argentine have HTRW concerns. Construction cannot occur on top of contaminated soil.

Construction in these areas referenced above will require close coordination with the railroad companies. Trains will need to be staggered to allow movement of equipment into and out of the construction area. Falsework could be built as a last resort if certain train patterns cannot be altered.

The construction plan for the new floodwall near station 276+70 is largely driven by access and available staging area due to the close proximity of the tracks. Equipment will need to enter the area from the upstream end, so it would be easiest to work from downstream to upstream.

A-17.2.2 Material Sources

Concrete requirements for the I-wall, and any other associated levee structures, will be 4000 psi. Fine aggregate will come from the Missouri or Kansas Rivers. Additional requirements will be to use a cement that would circumvent an alkali/silica reaction, have 5-7% air entrainment, and prohibitive use of chloride admixtures. The proposed borrow area is shown in the Civil Design chapter (Chapter A-11) of this appendix.

A-17.2.3 Construction Procedures

Results of the geotechnical analyses provided one area in which an underseepage berm would need to be constructed. Additional recommendations included buried collector systems and the need to remove existing material for replacement with impervious fill. These items can be accomplished by conventional means. Earthmoving equipment would place the berm material in compacted lifts. Small bulldozers (or small tracked equipment) and a track hoe can be utilized for preparation of the buried collector systems and removal of existing sand deposits. Once unwanted material is removed, it will be hauled to an approved disposal area offsite.

Global stability analysis generally resulted in various berm thickness recommendations coincident with the landside levee raise. This can again be accomplished by conventional earthmoving equipment. Material is to be excavated, loaded, and hauled using on-highway dump trucks over the existing roadways where needed. Therefore, travel from borrow sites to the ultimate placement locations would require frequent street sweeping and potential repairs.

The recommended plan for Argentine considers no permanent impact to the railroad tracks. Therefore, a levee top cap, I-wall, and relief wells have been proposed in the areas of railroad tracks. For the I-wall construction, top of levee will be removed along with any riprap that is in the way. A notch will be cut from the riverside of the levee crest to accommodate the I-wall structure. The excavated material will be placed on the landside of the levee. In areas of contamination, however, the excavated material will be placed riverside of the levee or hauled to an offsite stockpiling area so as not to disturb landside contaminates. The sheetpile will then be driven. Once the sheetpile is in place, the concrete wall will be constructed. After the concrete wall has cured, backfilling of the I-wall will commence. The material landside of the levee will be lifted over the new I-wall and dumped. It is assumed a small dozer and roller/compactor will be used to backfill against the wall.

Floodwall at Station 276+70. Earthen levee exists from Station 253+92 to Station 276+70, where the second of Argentine's two floodwalls extends east. This floodwall is adjacent to the BNSF Railroad tracks, all the way to Station 287+92 (about 1200 feet). The walls are inverted cantilever T-walls on spread footing foundations. A stop log closure structure continues to station 288+57, crossing the same six lines of

Santa Fe Railroad track and using timber stop logs for closure. For the Nominal 500-year plus 3 feet levee raise alternative, the floodwall requires replacement.

Floodwall at Station 251+65. A floodwall protecting the Argentine Boulevard Pump Station starts at Station 251+65 and ends at Station 253+92 (about 225 feet). Analysis shows that the floodwall would need to be replaced under the assumed raise alternative. Excavation and removal of the existing floodwall would begin the construction sequence. In doing this, a pit will be dug about 22 feet deep where the earthen levee currently meets the floodwall (on both sides). The pump plant sits on high ground, so the breech in protection for the 100-year event is a relatively minor longitudinal distance. There would need to be a stockpile of impervious material and backfilling equipment standing by to fill the excavation if the need arose. As with removal of the existing floodwall, construction of the new floodwall could be accomplished with conventional methods and equipment.

Pump Plants. The Turner Pump Station requires an existing pump to be replaced by a higher capacity pump and the top of the discharge chamber will need to be raised to coincide with the top of the levee. Raising the discharge chamber will require replacement of the sluice gate stem, installation of a new motor actuated gate hoist, and installation of new stem guides. Seven relief wells will be installed for uplift concerns.

It was concluded that the Argentine Pump Station and inlet and outlet culverts should be replaced. A construction sequence was developed for construction of the new plant. Petroleum contamination is present in this area. Since groundwater is below excavation depth, handling of contaminated water is not anticipated during construction. Contaminated soil, however, is anticipated, and will be hauled to a suitable disposal area and clean fill material obtained for backfill. The sequence is as follows:

- demolition of existing maintenance building
- build new inlet pipe (use deep trench braced excavation)
- construct new pump station (possibly incorporate shoring into the pump
- station)
- extend existing levee to pump station and create positive tie-in
- construct temporary floodwall from pump station to existing floodwall
- excavate and construct outlet pipe from pump station to river (use cofferdam as necessary to prevent the Kansas River from flooding construction site)
- tie-in new inlet pipe to existing inlet culvert on landside
- abandon existing pump station (the pump station may be abandoned by removing the top 3 feet and backfilling over the area with soil)
- abandon existing inlet, and outlet culverts, as well as the gatewell (the existing inlet pipe, gatewell, and outlet pipes will need to be removed or filled with grout - may also require filling of voids with grout along the outside of the structures)
- extend remaining portion of levee to pump station and create positive tie-in

The Strong Avenue Pump Station needs to be strengthened. A steel pilaster and braced strut design is proposed for strengthening the pump station foundation walls, along with a thickened reinforced slab to address floor strength and station uplift

concerns. The most feasible alternative for strengthening of the older culvert is to line the culvert with a new pipe.

Closure Structures. Based on stability anaylsis, replacement stop log gap closure structures would be required at Stations 29+02 and 288+57. Stop logs can be extruded offsite by the manufacturer. These gaps can be fitted and altered for the stop logs at a convenient time in the construction process as to allow minimum interference with floodwall and levee construction

Gatewell Extensions. Several gatewell extensions are required under the Nominal 500-year plus 3 feet raise alternative. For the gatewell raises, the existing top slab of the gatewell will be removed, wall extensions poured, and then a new top slab poured. Such a procedure will allow a greater ease of access into the gatewell and prevent possible entrance problems associated with navigating through multiple floor slab openings.

Bridges. The Kansas Avenue West, I-635, and Turner (K-32) bridges will require ramp modifications to maintain access to the levee. The I-635 bridge will require a bump out of the levee maintenance road to maintain the required minimum clearance. All modifications will be accomplished through the use of aggregate surfacing leveled by conventional grading equipment.

Utility Crossings. A study of the utilities crossing the Argentine Unit was conducted in order to estimate costs for relocation or removal of functioning or abandoned utilities. The study determined that pressure pipelines currently passing under the levee would be relocated over the levee. The lines would be hot-tapped in order to maintain service to customers during construction.

A-17.2.4 Water Control

Floodwall at Station 276+70. A temporary levee to maintain a 100-year level of flood protection is not required because the landside area is higher then the 100 year event's water surface. However, to re-establish existing protection, a temporary berm would be constructed starting at about Station 276+70. This would be about a 7-foot high cutback berm extending across to high ground for a distance of about 300 feet. The berm would be constructed at the latest possible time (same time as closure of the nearby stoplog gap) to prevent flooding so that the railroad lines are not adversely affected. Workers would need to place sandbags around the tracks as well. The end of protection (railroad tracks) would be lost in this rare scenario, but integrity of the floodwall's purpose would be maintained.

As alluded to above, the 100-year flood event would only flood excavation during construction of the new wall. Emergency backfilling for any open excavation would be necessary through the use of stockpile and on-hand backfilling equipment. One option would be to have soil loaded on rail cars ready to be brought in (or on rented track and cars on-site). If the excavation is open and the temporary levee is already built, rock fill will need to be dumped along the landside face of excavation to prevent scour. Additionally, personnel would need to be ready for floodfighting boils that could potentially occur.

Argentine Pump Station and Floodwall at Station 251+65. In order to provide assurance to the existing level of protection (greater than the 100-year event), the

construction sequence of the new pump plant and floodwall is carefully considered. First, the existing levee will be extended to the pump station to create a positive tie-in. Then, a temporary floodwall will be constructed from the pump station to the existing floodwall. Finally, excavation and construction of the outlet pipe from the pump station can occur. A cofferdam will be used as necessary to prevent the Kansas River from flooding the construction site.

A-17.3 EAST BOTTOMS (MISSOURI AND BLUE RIVERS CONFLUENCE AREA)

The thin blanket zones in the East Bottoms reach from Station 403+00 to Station 420+00 are recommended to be protected using relief wells.

A-17.3.1 Site Constraints

Access to the site should not be a problem as there is a berm available. However, avoidance of possible HTRW problems in this area should be carefully planned during design and construction.

Construction procedures will need to allow for protection of power lines in the area, but underground utilities should not interfere with operations.

A-17.3.2 Material Sources

Relief well risers and piping materials will be purchased from an approved manufacturer. Pre-cast concrete structures and appurtenances will be utilized where possible.

A-17.3.3 Construction Procedures

Construction of the relief well system can be accomplished by conventional means. Trench digging equipment can be utilized for preparation of the relief well collector system, while lifting equipment can provide the means for placement of the risers and other components.

There are existing power lines running along the Bayer property line which would have to be protected (braced) during installation of the relief wells.

A-17.3.4 Water Control

Water control for this area would consist of an emergency stockpile of impervious material to fill the excavation if the river were to reach dangerous levels during construction.

A-17.4 FAIRFAX-JERSEY CREEK (BPU FLOODWALL)

The probability of failure for the BPU Floodwall (from station 287+86 to station 302+32), based on both pile strength and foundation resistance (pile capacity), was determined. Due to the insufficient pile strengths and pile capacities, foundation modifications or floodwall replacement is required to reduce the load on the existing piles and achieve an acceptable factor of safety. Modification of the floodwall is the recommended alternative.

A-17.4.1 Site Constraints

Access could be difficult because of BPU plant operations. Also, coordination with timing of BPU plant operations could impact the available locations of construction trailers and contractor storage areas.

There is a 500-foot reach along the proposed floodwall modification that contains a series of underground utilities. Construction crews will need to work carefully around the utility lines during pile installation. Additionally, there is a gatewell tower built adjacent to the toe of the levee that may require special consideration.

The area of recommended new floodwall discussed herein contains an old intake plant structure located about 30 feet from the existing floodwall. It is planned to leave the pumphouse building intact during and after construction. However, to prevent any future underseepage pressure concerns, the basement of the building would be filled with sand or flowable fill after perforating the foundation slab. All pumping equipment currently inside the building would be removed prior to work on the site. Also, there are a number of pipes still apparently connected to the pumphouse. Those pipes would be grouted full according to standard abandonment procedures.

A-17.4.2 Material Sources

Concrete requirements for the modification/reinforcement of the floodwall will be 4000 psi. Fine aggregate will come from the Missouri or Kansas Rivers. Additional requirements will be to use a cement that would circumvent an alkali/silica reaction, have 5-7% air entrainment, and prohibitive use of chloride admixtures.

A-17.4.3 Construction Procedures

The recommended modification of the floodwall is the construction of an additional fourth row of auger cast piles landside of the exiting walls. The piles would be auger cast and not driven because of the close proximity of the Kansas City, Kansas Board of Public Utilities power plant and the sensitive nature of much of the equipment used for their operations. For the purposes of the cost estimate, 50-ft deep, 24” diameter auger cast piles at seven foot on center are assumed sufficient to relieve the overloading on the landside pile. For plans and specifications, a more thorough design would need to be performed to size the auger cast piles. The fourth row would be joined to the existing pile cap by doweling into the existing floodwall pile cap. A buttress would be installed over each pile to transfer load from the wall to the additional piles. The existing stem wall’s longitudinal steel has been checked to verify that there is sufficient longitudinal reinforcing to transfer the wall loading to the buttresses.

A-17.4.4 Water Control

As the existing floodwall is being left in place, water control will generally not be an issue for the proposed improvement. However, the potential for underseepage must be considered. Therefore, emergency backfilling for any open excavation would be necessary through the use of material stockpile and on-hand backfilling equipment. This would need to be closely coordinated with BPU to maintain adequate resources on site.

A-17.5 FAIRFAX-JERSEY CREEK (JERSEY CREEK SHEETPILE WALL)

The retaining wall structure provides stability of the foreshore bank for the existing levee with I-wall flood protection. Analysis in this feasibility study showed that replacement of the sheetpile wall is necessary. The recommended solution for strengthening this reach of the Fairfax-Jersey Creek flood protection unit is the use of a driven sheet pile system without reliance on tieback anchors.

A-17.5.1 Site Constraints

The proposed sheetpile wall system would be constructed landside of the existing sheetpile wall using a barge on the Missouri River. Access should not be difficult as long as close coordination is maintained with Kaw Valley Drainage District.

The sequence of construction should be staged such that the existing sheet pile wall and tieback is not weakened further until a new system has been installed. Careful planning of site access and use will help meet this goal.

A-17.5.2 Material Sources

The driven sheetpile wall system will be purchased from an approved manufacturer. Prefabrication will be utilized where appropriate to save time and materials.

A-17.5.3 Construction Procedures

A conventional rig, situated on a barge, will be utilized for driving the sheetpile. The rig must have a sufficient reach to safely install the new wall behind the existing. The construction efforts should not be allowed to overload the existing wall by surcharging the foreshore bank landside of the wall. The existing dead man support would be left in place and not utilized. The sequence of construction should be staged such that the existing sheet pile wall and tieback is not weakened further until a new system has been installed.

A-17.5.4 Water Control

The existing wall is being left in place, so water control should not be a major construction issue. However, the potential for underseepage must be considered. Therefore, emergency backfilling for any open excavation would be necessary through the use of material stockpile and on-hand backfilling equipment.

A-17.6 NORTH KANSAS CITY-LOWER (HARLEM AREA)

The present recommended plan for controlling underseepage and reducing the uplift at the toe of the levee, from stations 210+00 to 240+00, is a buried collector system.

A-17.6.1 Site Constraints

Access is somewhat more difficult for the Harlem area than other focus areas because of the residences and commercial buildings in the vicinity. The project team is aware of a sewage force main which crosses near the project. Preliminary investigation leads to the conclusion that it is not directly in the path of the new collector system.

However, temporary bracing may be necessary. In addition, nearby power poles will need to be braced during construction.

A-17.6.2 Material Sources

The collector system manholes and piping materials will be cast-in-place.

The system is designed so that commonly available rental pumps may be used for evacuation of flows.

A-17.6.3 Construction Procedures

As a minimum design consideration, the flows from the buried collector system can be collected in manholes during high water. The sponsors will be responsible for setting up portable pumps and discharges lines to dispose of the underseepage water back to the river source by carrying the flow up and over the levee through temporary piping systems (also provided by the sponsor). The recommended pumping facilities requirements are discussed in the Civil Design chapter of this appendix.

Construction of the collector system can be accomplished by conventional means. Trench digging equipment can be utilized for preparation of the buried collector system, while lifting equipment can provide the means for placement of the risers and other components.

A-17.6.4 Water Control

Water control for this area would consist of an emergency stockpile of impervious material to fill the excavation if the river were to reach dangerous levels during construction.

A-17.7 NORTH KANSAS CITY-LOWER (NATIONAL STARCH AREA)

Underseepage analysis performed during the feasibility study determined that a project to control potential seepage pressures near the National Starch area is necessary. Pressure relief wells are recommended for the area between Stations 259+00 to 271+00.

A-17.7.1 Site Constraints

Access is slightly more difficult for the National Starch area than other focus areas because of the distance to the site accessed along the top of levee, or through the adjacent National Starch site. The project team is aware of existing water lines, electrical duct banks, and an overhead steam line in the vicinity of the new pump station. There is also a series of power poles in close proximity to the proposed project area.

A-17.7.2 Material Sources

The relief well system manholes and piping materials will be cast-in-place.

A-17.7.3 Construction Procedures

A line of wells was designed to provide the needed pressure relief to result in an adequate factor of safety at the point midway between wells. Twenty 10-inch diameter stainless steel pressure relief wells, spacing on 75-feet centers, are estimated to bring the area within present design requirements. Construction of the relief well system can be accomplished by conventional means. Trench digging equipment can be utilized for

preparation of the buried well system, while lifting equipment can provide the means for placement of the risers and other components.

Since the relief well system is to discharge below existing grade, a pump system is required to evacuate intercepted underseepage flows. The proposed pump station is located approximately at NKC levee station 260+00. Evacuated flows would be pumped over the levee and discharged riverward. The use of totally enclosed fan cooled (TEFC) motors and electrical panel designed for outdoor use will eliminate the need for a superstructure. A gantry crane would be provided for pump and motor maintenance. Given that the pump station is located in a heavily industrialized area and is near a KCP&L substation, back up power was not considered necessary as outages are not expected to last for long durations. Discharge piping would be placed on top of the levee and fill would be placed over piping to provide adequate cover. Outlet headwalls and riprap blanket will be provided at discharge pipe outfalls to prevent erosion.

Sheet piling will be needed to shore the waterline and electrical duct bank within the limits of excavation. Nearby power poles will need to be braced during construction.

A-17.7.4 Water Control

Since the levee fill would not be removed during construction, a temporary ring levee would not be required. Water control for this area would consist of an emergency stockpile of impervious material to fill the excavation if the river were to reach dangerous levels during construction.